

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
28 June 2001 (28.06.2001)

PCT

(10) International Publication Number
WO 01/47268 A1

(51) International Patent Classification⁷: H04N 7/16, 7/173

(21) International Application Number: PCT/US00/34642

(22) International Filing Date:
20 December 2000 (20.12.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/470,395 22 December 1999 (22.12.1999) US

(71) Applicant: PHONEX BROADBAND CORPORATION
[US/US]; 6952 High Tech Drive, Midvale, UT 84047 (US).

(72) Inventors: BARTHOLOMEW, David; 5047 Cree Drive, West Valley, UT 84120 (US). STETTLER, Alan; 4927 South Murray Boulevard, #28, Murray, UT 84123 (US). SMITH, Scott; 1027 W. Sunberry Drive, Murray, UT 84123 (US). BULLOCK, Scott; 10280 S. Temple View Drive, South Jordan, UT 84095 (US).

(74) Agents: SADLER, Lloyd, W. et al.; McCarthy & Sadler, LC, Suite 100, 39 Exchange Place, Salt Lake City, UT 84111 (US).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.

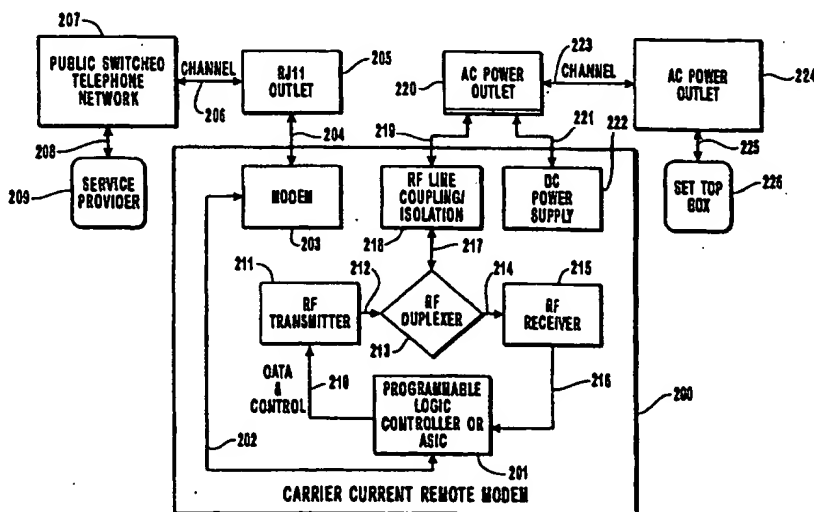
(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:

- With international search report.
- Before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments.

[Continued on next page]

(54) Title: WIRELESS SET TOP BOX DATA LINK



(57) Abstract: A system for communication between a television set top box (226) and a service provider (209) using a remote base unit (200), which connects to a public telephone network (207) through a standard phone jack (205). This system removes the requirement for dedicated wiring between such a base unit (200) and set top box (226). This invention provides the capability of communicating between a set top box and a remote base unit using either AC power line communication channels (223) or over-the-air RF communications (425). Moreover, this invention includes an embedded transceiver (130, 133) into the set top box (226) and includes a modem (203), and associated telephone interface circuitry, into the base unit (200). This invention is particularly adapted to the set top box to base unit communication channel useful in satellite pay-per-view systems, internet service provider connections, video storage and routing system, direct broadcast set top boxes and other products and services for sending and receiving such information as program guides, stock quotes, and other types of data used in connection with set top boxes.

BEST AVAILABLE COPY

WO 01/47268 A1



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

WIRELESS SET TOP BOX DATA LINK

Background of the Invention

Field of the Invention. This invention relates to data links, or communication

5 channels, between set top boxes, which are used for controlling video signal access, and an information service provider, which uses the Public Switched Telephone Network connection. More specifically, this invention relates to communication links between set top boxes and an information service provider which uses a wireless communication channel as a connection to standard telephone lines.

10 Description of Related Art. A variety of communication systems and devices have been proposed which provide communications between set top boxes and the like, and an information service provider. Typically, these systems and devices require a telephone line connection between the set top box and the central office, which in turn is connected over the public switched telephone network to the service provider.

15 However, in many instances, a wired telephone line between the set top box and the central office, or remote modem for communication with the information service provider, is unavailable. This invention addresses communication between the set top box and a remote modem without requiring dedicated telephone lines.

For general background, the reader is directed to the following U.S. patent
20 documents, each of which is hereby incorporated by reference in its entirety for the material contained therein.

U.S. Patent No. 5,488,412 describes a home controller that receives signals from the cable television system and which uses a cable demodulator tuned to the RF frequency of the channel, which carries the data information.

U.S. Patent No. 5,534,913 describes a split channel bridging unit that includes
5 a router that operates under the control of a control processor to route packets of information destined for a user to a modulator, which is connected to the cable distribution head-end of the cable television system, which serves the requesting user.

U.S. Patent Nos. 5,610,910 and 5,828,666 describe a system for providing flexible and adaptable multiservice access to voice telephony, CATV and wireless
10 networks.

U.S. Patent No. 5,629,978 describes a system and method for purchasing, customizing and modifying switch-based and Advanced Intelligent Network telephone services through the Broadband Network.

U.S. Patent No. 5,784,683 describes a broadcast system that supplies
15 multiplexed channels to a plurality of receiving systems.

U.S. Patent Nos. 5,790,170 and 5,943,047 describe a subscriber terminal that sends a demand for two-way information transmission that includes at least information for identifying the demand subscriber terminal, information for identifying the requested information, and information relating to the urgency of the
20 requested information to the information distribution transmission center through the going-up line.

U.S. Patent No. 5,812,786 describes a public switched telephone network (PSTN) that provides communication of digital data from a data provider or LAN to one or more of a plurality of subscriber premises.

U.S. Patent No. 5,812,930 describes a bi-directional or unidirectional information handling system for data exchange and distribution.

U.S. Patent No. 5,822,324 describes a data communication system that has a wireless telephone network (cellular) combined with a broadband digital transmission
5 through a broadcast network.

U.S. Patent No. 5,861,881 describes an interactive computer system, which may operate on a computer network, wherein subscribers interact with a fully interactive program through the use of input devices and a personal computer or a television.

10 U.S. Patent No. 5,893,024 describes a method and apparatus for reducing ingress noise in the upstream frequency band and reducing power consumption in a cable communication system.

U.S. Patent No. 5,910,970 describes a modem that operates selectively in the voice-band frequency band and higher frequency bands.

15 U.S. Patent No. 5,933,607 describes a communication system, protocol and method designed to facilitate information transfer, that includes user and control information from Continuous Bit Rate (CBR) and/or non CBR signal sources.

U.S. Patent No. 5,970,088 describes a central office xDSL modem pool that has N logical xDSL modems.

20 U.S. Patent No. 5,970,473 describes a catalog information database accessible by remotely located customers to provide in-home shopping capabilities.

Summary of the Invention

It is desirable to provide a wireless data link between a set top box and a Public Switched Telephone Network (PSTN) which does not require a telephone line connection at the set top box location.

5 Therefore, it is the general object of this invention to provide a wireless data link providing communication between a set top box and a Public Switched Telephone Network (PSTN), where a wireless data link is required to gain access to the PSTN.

10 It is a further object of this invention to provide a wireless data link between a set top box and a Public Switched Telephone Network, which is compatible with satellite pay-per-view programming systems.

It is a further object of this invention to provide a wireless data link between a set top box and a Public Switched Telephone Network that is compatible with cable pay-per-view programming systems.

15 It is a further object of this invention to provide a wireless data link between a set top box and a Public Switched Telephone Network, which works with direct broadcast set top boxes that use a modem connection to communicate with the PSTN.

It is a further object of this invention to provide a wireless data link between a set top box and a Public Switched Telephone Network, which is adapted to work with
20 established Internet browsers.

It is a further object of this invention to provide a wireless data link between a set top box and a Public Switched Telephone Network that is compatible with video storage devices.

It is a further object of this invention to provide a wireless data link between a set top box and a Public Switched Telephone Network that is compatible with most standard data communication requirements associated with set top boxes, including but not limited to program guides, stock quotes and the like.

5 It is a still further object of this invention to provide a wireless data link between a set top box and a Public Switched Telephone Network that makes use of either power line carrier communication or RF carrier communications.

It is a still further object of this invention to provide a wireless data link between a set top box and a Public Switched Telephone Network, which uses a digital
10 data link between the set top box and the remote modem.

It is another object of this invention to provide a wireless data link between a set top box and a Public Switched Telephone Network, which employs a digital transceiver integrated into the set top box.

Another object of this invention is to provide a wireless data link between a set
15 top box and a Public Switched Telephone Network which employs a modem in the base unit and wherein the interface and protocols to the service provider are controlled by the base unit and the embedded extension unit.

A still further object of this invention is to provide a wireless data line between a set top box and a Public Switched Telephone Network, which uses modem
20 data modulation techniques, preferably selected from frequency shift keying; phase shift keying; and differential binary phase shift keying.

It is a still further object of this invention to provide a wireless data line between a set top box and a Public Switched Telephone Network that does not require a unique interface to the central office.

It is another object of this invention to provide a wireless data line between a set top box and a Public Switched Telephone Network that has the ability to embed a digital radio frequency transceiver, for transmission either across an AC power line or through the air, into the set top box and which incorporates a modem and telephone interface in a base unit.

These and other objects of this invention are readily apparent to those of ordinary skill in the art upon review of the following drawings, detailed description and claims and are accomplished by the system described herein.

Brief Description of the Drawings

In order to show the manner that the above recited and other advantages and objects of the invention are obtained, a more particular description of the preferred embodiment of the invention, which is illustrated in the appended drawings, is described as follows. The reader should understand that the drawings depict only a preferred embodiment of the invention, and are not to be considered as limiting in scope. A brief description of the drawings is as follows:

Figure 1a shows a block diagram of the preferred carrier current remote modem unit of this invention.

Figure 1b shows a block diagram of the preferred set top box data transceiver of this invention.

Figure 2 shows a block diagram of the preferred carrier current system with remote modem details of this invention.

Figure 3 shows a block diagram of the preferred carrier current system with set top box RF data transceiver detail of this invention.

Figure 4 shows a block diagram of the preferred RF system with a detail of the RF remote modem of this invention.

Figure 5 shows a block diagram of the preferred system with a detail of the RF set top box data transceiver of this invention.

5

Detailed Description of the Invention

This invention is a communication system for providing communication between remote set top boxes to and from a Public Switched Telephone Network (PSTN) that does not require wired telephone connections between the set top box and the RF remote modem. This invention has two primary alternative embodiments:
10 an RF over the air channel embodiment and a power line carrier channel embodiment. The preferred system of this invention employs a digital transceiver integrated into the set top box and a modem installed inside a remote unit, which is in communication with the telephone central office or PSTN service provider.

Figure 1a depicts a block diagram of the preferred base unit 100 of this
15 invention having an internal modem 115. This base unit 100 is connected to a telephone central office 119 using standard techniques, such as an RJ-11 jack connection to the telephone wiring. Alternatively, the base unit 100 can be connected to a digital wide area network. A digital access arrangement (DAA) 117 provides the conversion of the analog telephone signals to and from the digital format used
20 internally in the base unit 100. This invention is adapted to make use of a wide variety of modulation techniques, including but not limited to on/off keying; frequency shift keying (FSK); phase shift keying (PSK); and binary phase shift keying (DBPSK). Data 116 is communicated electronically between the DAA 117 and the internal Modem 115. The internal Modem 115 is electrically connected to a

controller, (PLC ASIC) 113, thereby providing for the transfer of control signals and data 114. The preferred controller is an application specific integrated circuit, designed using well established techniques to provide the control and "handshaking" of the data received and to be transmitted through the base unit 100. The controller

5 113 receives data 108 from a receiver 107 and sends control and data signals 109 to a transmitter 111. In the preferred embodiment of this invention, the received data 108 and the transmitted control and data signals 109 are connected using an internal bus 110. The transmitter 111 provides an RF 112 signal to an RF Duplexer 103, which in turn transmits the data 104 to the set top box 120 (shown in figure 1b) across either a

10 power line carrier or RF data link 105. The receiver 107 receives RF data 106 from the RF duplexer 103 for transmission to the controller 113. A power supply 101 is provided, receiving AC power 102 for the powering of the base unit 100.

Figure 1b depicts a block diagram of the preferred set top box 120 data transceiver of this invention. Data 136 is received from and sent to the base unit 100

15 via an RF duplexer 135. This data 136 is transmitted via a power line carrier current or an RF data link channel. The data 137 received by the RF duplexer 135 is sent to a receiver 130, which provides data 129 to the controller (PLC ASIC) 131. The preferred controller is an application specific integrated circuit, designed using well-established techniques to provide the control and "handshaking" of the data received

20 and to be transmitted through the set top box 120. The controller 131 also sends control and data signals 132 to the transmitter 133, which sends transmitted signals 134 to the RF duplexer 135 for transmission to the base unit 100. The controller 131 sends and receives control data 128 from the set top box controller 127, which sends and receives control signals 126 to and from the video hardware 123. The standard

video hardware 123 receives a cable television signal 125 from a television signal source and outputs the video signal 124 to a standard television. A power supply 121 is provided to power the set top box via AC power 122.

Figure 2 depicts an alternative block diagram of the preferred power line carrier current remote modem of this invention as used within a base unit 200. A telephone service provider 209 sends and receives telephone signals 208 to and from a public switched telephone network 207. The public switched telephone network 207 communicates across standard telephone wiring channel 206 to an RJ-11 outlet 205. A standard RJ-11 plug and cable 204 connects the RJ-11 outlet 205 with the modem 203, which is installed within the base unit 200. The modem 203 communicates 202 with a controller 201. The preferred controller 201 of this embodiment is either a programmable logic controller or an application specific integrated circuit, designed using well-known techniques, to control the base unit 200. The controller 201 sends data and control signals 210 to an RF transmitter 211, which in turn sends the data 212 to an RF duplexer 213. The controller 201 receives data 216 from the RF duplexer 213 via an RF receiver 215, which is in electronic communication 214 with the RF duplexer 213. The RF duplexer 213 sends data signals 217 to an RF line coupling / isolation circuit 218. The RF line coupling / isolation circuit 218 is connected electrically 219 to a standard AC power outlet 220. The AC power outlet 220 also provides an AC power connection 221 to the base unit's 200-power supply 222. The AC power outlet 220 uses existing AC power lines 223 to provide a communication channel to a second AC power outlet 224, typically within the same building or facility as the first AC power outlet 220. The second AC power outlet 224 is electrically connected 225 to the set top box 226.

Figure 3 depicts a detailed block diagram showing the preferred AC power line carrier current embodiment of the set top box 226 of this invention. The service provider 209 is shown electrically connected 208 to a public switched telephone network 207, which communicates across standard telephone lines 206 to an RJ-11 telephone outlet 205. The base unit 200 having an internal modem 203 is connected via standard telephone wire and jack 204 to the RJ-11 outlet 205. The base unit 200 is connected 219 to an AC power line channel 223 via a standard AC power outlet 220. The second AC power outlet 224 provides AC power 225b to a standard power supply 314, which provides power to the set top box 226. The second AC power outlet 224 also connects 225a to an RF line coupler / isolation circuit 313. The RF line coupler / isolation circuit 313 connects 312 to an RF duplexer 308 for the transfer of signals between the set top box 226 and the base unit 200. Received data is communicated 309 from the RF duplexer 308 to an RF receiver 310. The RF receiver 310 sends received data 311 to the controller 315. The controller 315 is preferably a programmable logic controller or an application specific integrated circuit designed with well known techniques to control the operation of the set top box 226 communication. The controller 315 transmits data and control signals 305 to an RF transmitter 306, which sends the data 307 to the RF duplexer 308. Standard video hardware 302 is controlled via 303 by a standard set top box controller 301. The controller 315 and the standard set top box controller 301 communicate 303 to control the video hardware 302.

Figure 4 depicts an alternative block diagram showing the preferred RF base unit 400, having the internal modem 403, of this invention. A telephone service provider 409 sends and receives telephone signals 408 to and from a public switched

telephone network 407. The public switched telephone network 407 communicates across standard telephone wiring channel 406 to an RJ-11 outlet 405. A standard RJ-11 plug and cable 404 connects the RJ-11 outlet 405 with the modem 403, which is installed within the base unit 400. The modem 403 communicates 402 with a

5 controller 401. The preferred controller 401 of this embodiment is either a programmable logic controller or an application specific integrated circuit, designed using well-known techniques, to control the base unit 400. The controller 401 sends data and control signals 410 to an RF transmitter 411, which in turn sends the data 412 to an RF duplexer 413. The controller 401 receives data 416 from the RF

10 duplexer 413 via an RF receiver 415, which is in electronic communication 414 with the RF duplexer 413. The RF duplexer 413 sends data signals 417 across a conductor 417 to an RF antenna 418. The RF antenna 418 provides an RF over-the-air channel 419 to a second RF antenna 420, which is connected electrically 425 to the set top box 500. The over-the-air RF transmission may be any known RF channel including but

15 not limited to ELF, VF, VLF, LF, MF, HF, VHF, UHF, SHF, EHF and IR. An AC power outlet 424 is provided and connected 423 to a power supply 422 to provide AC power to the base unit 400. Alternative power sources may be substituted without departing from the concept of this invention.

Figure 5 depicts an alternative block diagram of the preferred RF set top box

20 500 of this invention. The service provider 409 is shown electrically connected 408 to a public switched telephone network 407, which communicates across standard telephone lines 406 to an RJ-11 telephone outlet 405. The base unit 400 having an internal modem 403 is connected via standard telephone wire and jack 404 to the RJ-11 outlet 405. The base unit 400 is connected 417 to an antenna 418 for over-the-air

RF transmission 419 to the set top box antenna 420. The over-the-air RF transmission may be any known RF channel including but not limited to ELF, VF, VLF, LF, MF, HF, VHF, UHF, SHF, EHF and IR. The set top box antenna 420 is electrically connected 425 to an RF duplexer 509. An AC power outlet 513 is electrically
5 connected 514 to the set top box power supply 515 to provide power to the set top box 500. Received data is communicated 510 from the RF duplexer 509 to an RF receiver 511. The RF receiver 511 sends received data 512 to the controller 501. The controller 501 is preferably a programmable logic controller or an application specific integrated circuit designed with well known techniques to control the operation of the
10 set top box 500 communication. The controller 501 transmits data and control signals 506 to an RF transmitter 507, which sends the data 508 to the RF duplexer 509. Standard video hardware 505 is controlled 504 by a standard set top box controller 503. The controller 501 and the standard set top box controller 503 communicate 502 to control the video hardware 505.

15 It is to be understood that the above-described embodiments of this invention are merely illustrative of numerous and varied other embodiments and applications, which may constitute applications of the principles of this invention. Therefore, the scope and breadth of this invention should be determined from the appended claims and their equivalents rather than by the description of the current preferred
20 embodiments of this invention. Such other embodiments may be readily devised by those skilled in the art without departing from the spirit or scope of this invention and it is our intent that such alternative embodiment be deemed to be within the scope of this invention.

Claims

We claim:

1. A system for communications between a television set top box and a remote modem, comprising:
 - 5 (A) a set top box, electrically connected to video hardware;
 - (B) a remote base unit in communication with a telephone network; and
 - (C) an RF communication link between said set top box and said remote base unit, wherein said RF communication link is an over-the-air communication link.
- 10 2. A system for communications between a television set top box and a remote modem, as recited in claim 1, wherein said communication link between said set top box and said remote base unit, is a digital communication link.
3. A system for communications between a television set top box and a remote modem, as recited in claim 1, wherein said communication link is an IR link.
- 15 4. A system for communications between a television set top box and a remote modem, as recited in claim 1, wherein said remote base unit further comprises an internal modem.
5. A system for communications between a television set top box and a remote modem, as recited in claim 1, wherein said base unit further comprises an RF
20 duplexer.
6. A system for communications between a television set top box and a remote modem, as recited in claim 1, wherein said set top box further comprises an RF duplexer.

7. A system for communications between a television set top box and a remote modem, comprising:
- (A) a set top box, electrically connected to video hardware;
 - (B) a remote base unit in communication with a telephone network; and
 - 5 (C) a communication link between said set top box and said remote base unit, wherein said communication link is a power line carrier communication link.
8. A system for communications between a television set top box and a remote modem, as recited in claim 7, wherein said communication link between said set top
- 10 box and said remote base unit, is a digital communication link.
9. A system for communications between a television set top box and a remote modem, as recited in claim 7, wherein said communication link uses a modulation technique selected from the group consisting of on/off keying, frequency shift keying, phase shift keying, and binary phase shift keying.
- 15 10. A system for communications between a television set top box and a remote modem, as recited in claim 7, wherein said remote base unit further comprises an internal modem.
11. A system for communications between a television set top box and a remote modem, as recited in claim 7, wherein said base unit further comprises an RF
- 20 duplexer.
12. A system for communications between a television set top box and a remote modem, as recited in claim 7, wherein said set top box further comprises an RF duplexer.

13. A system for digital communication between a television set top box and a remote base unit, comprising:

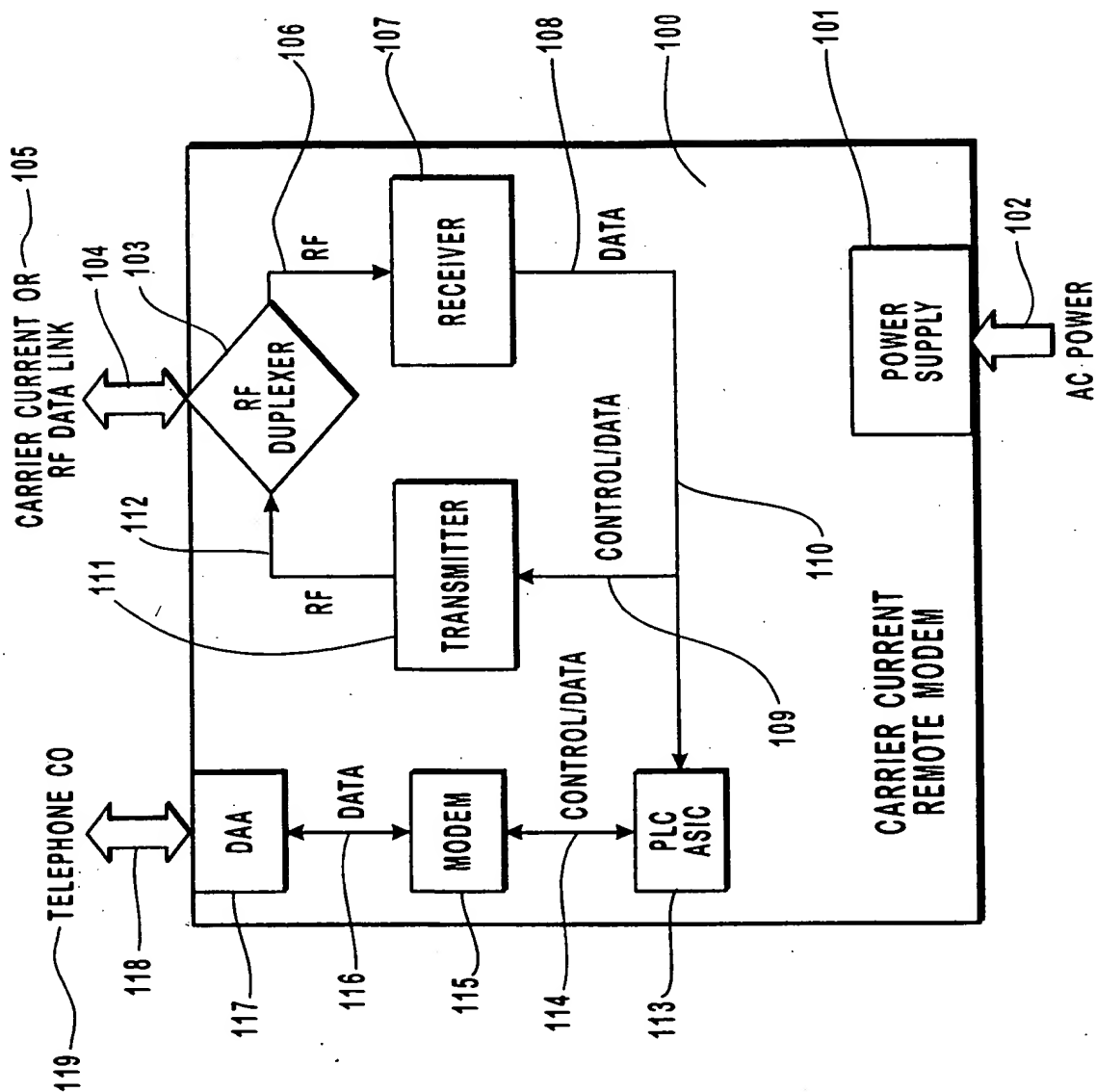
- (A) a set top box, connected to video hardware;
- (B) a remote base unit, in communication with a network; and
- 5 (C) a communication link between said set top box and said remote base unit, wherein said communication link is selected from the group consisting of over-the-air and power line carrier channels.

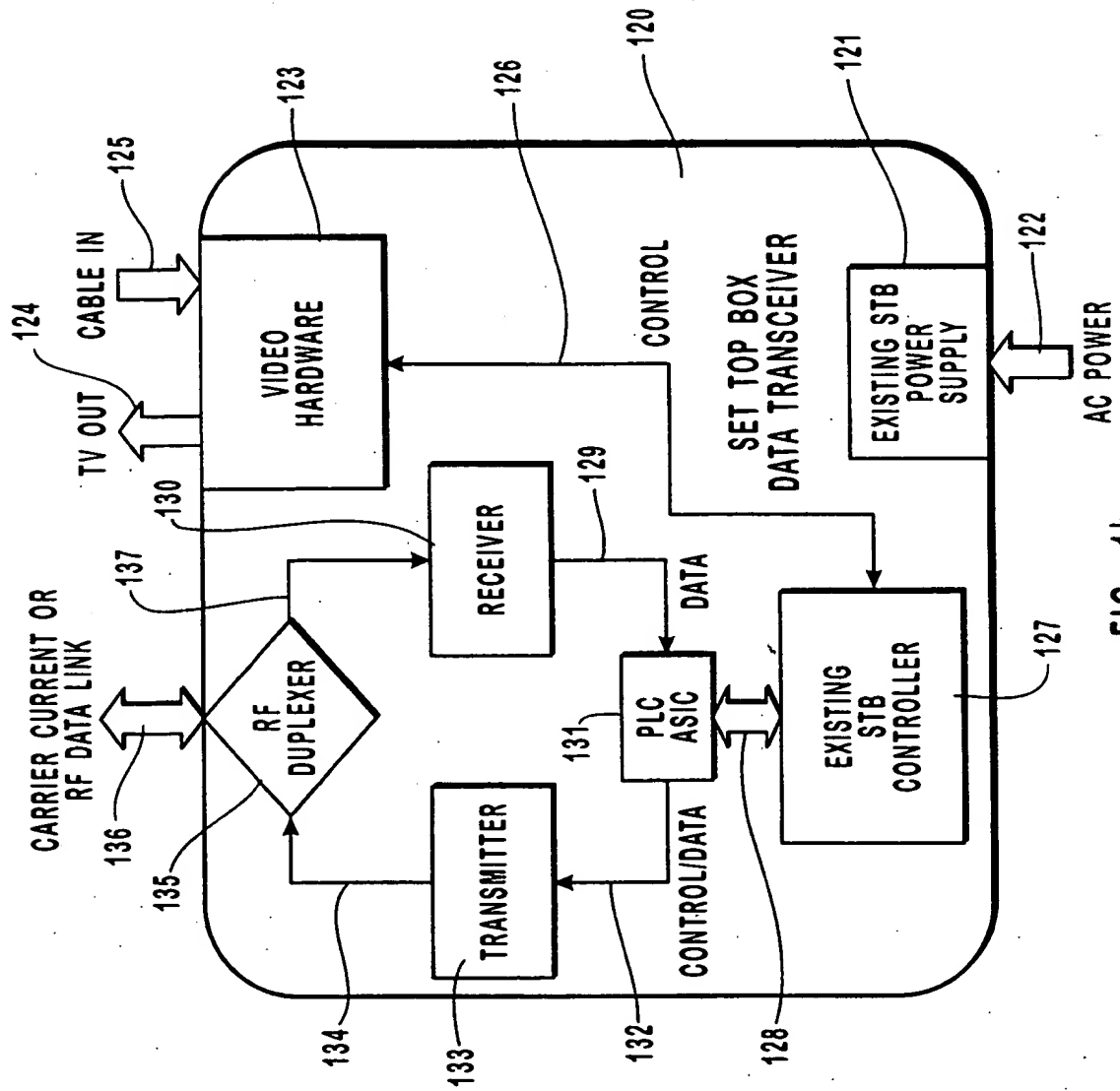
14. A system for digital communication between a television set top box and a remote base unit, as recited in claim 13, wherein said set top box further comprises:

- 10 (1) a set top box controller;
- (2) a controller electrically connected to said set top box controller;
- (3) a transmitter electrically connected to said controller;
- (4) a receiver electrically connected to said controller; and
- (5) an RF duplexer electrically connected to said receiver and said
- 15 transmitter.

15. A system for digital communication between a television set top box and a remote base unit, as recited in claim 13, wherein said base unit further comprises:

- (1) a modem;
- (2) a controller electrically connected to said modem;
- 20 (3) a transmitter electrically connected to said controller;
- (4) a receiver electrically connected to said controller; and
- (5) an RF duplexer electrically connected to said receiver and said
- transmitter.





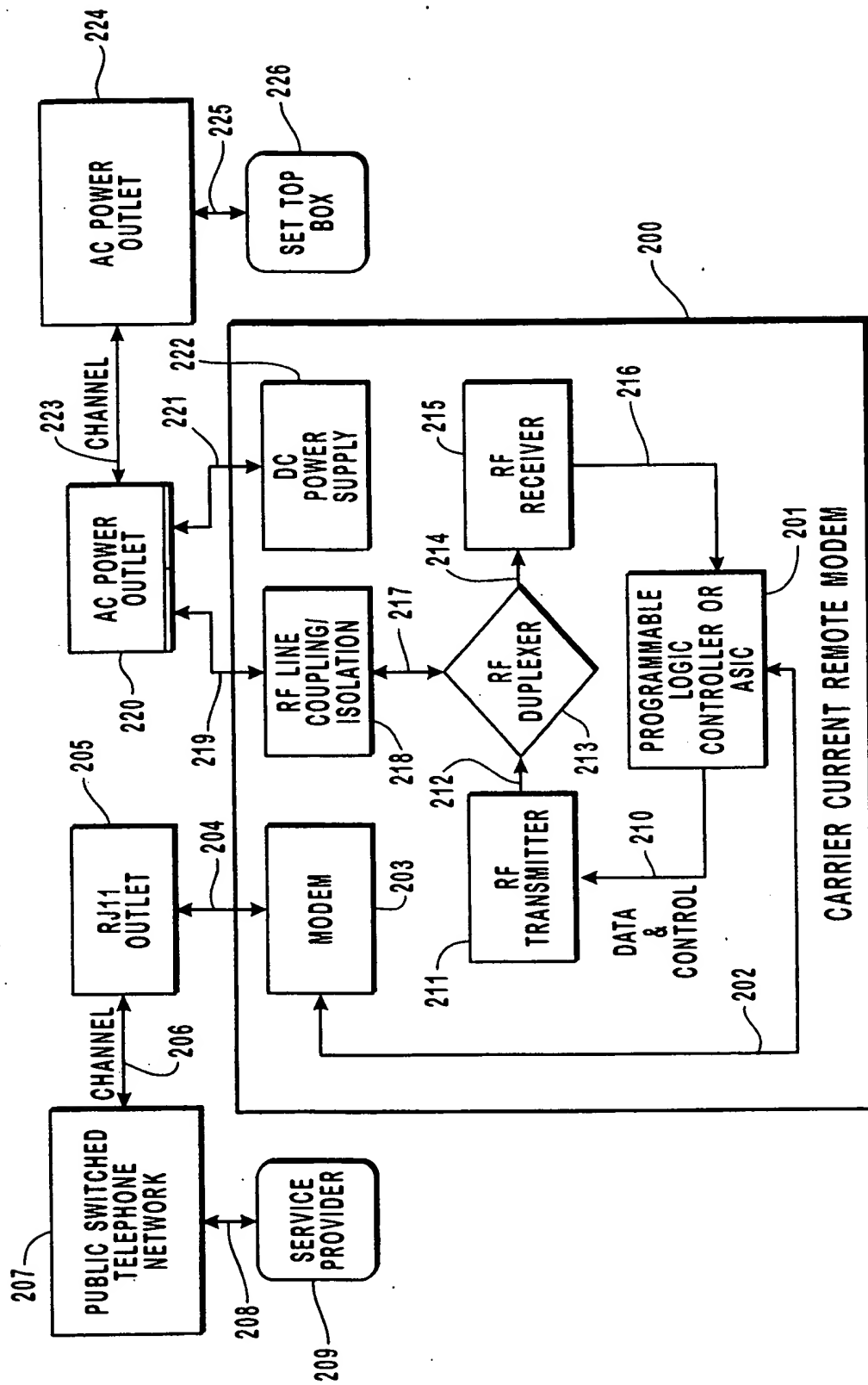


FIG. 2

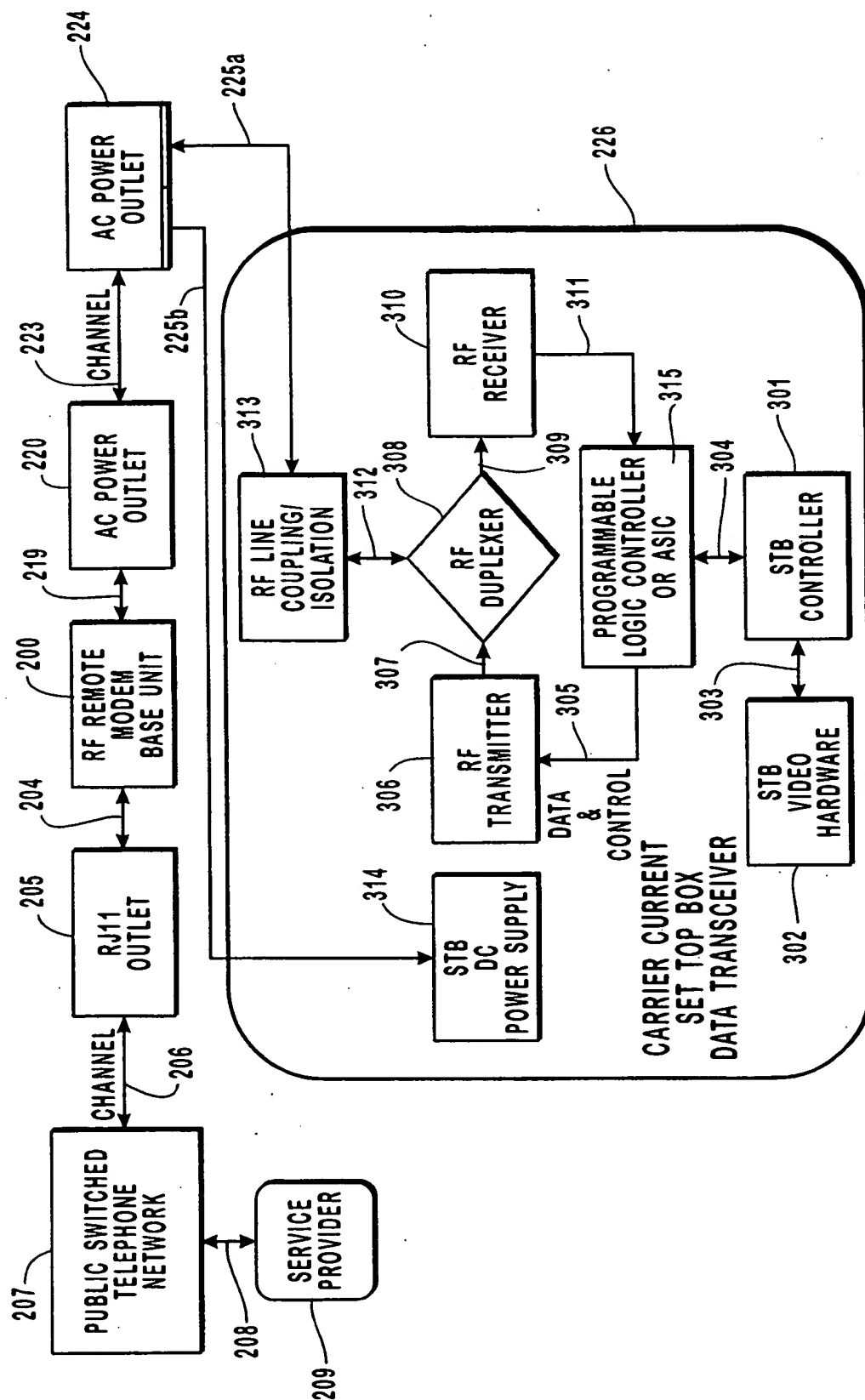


FIG. 3

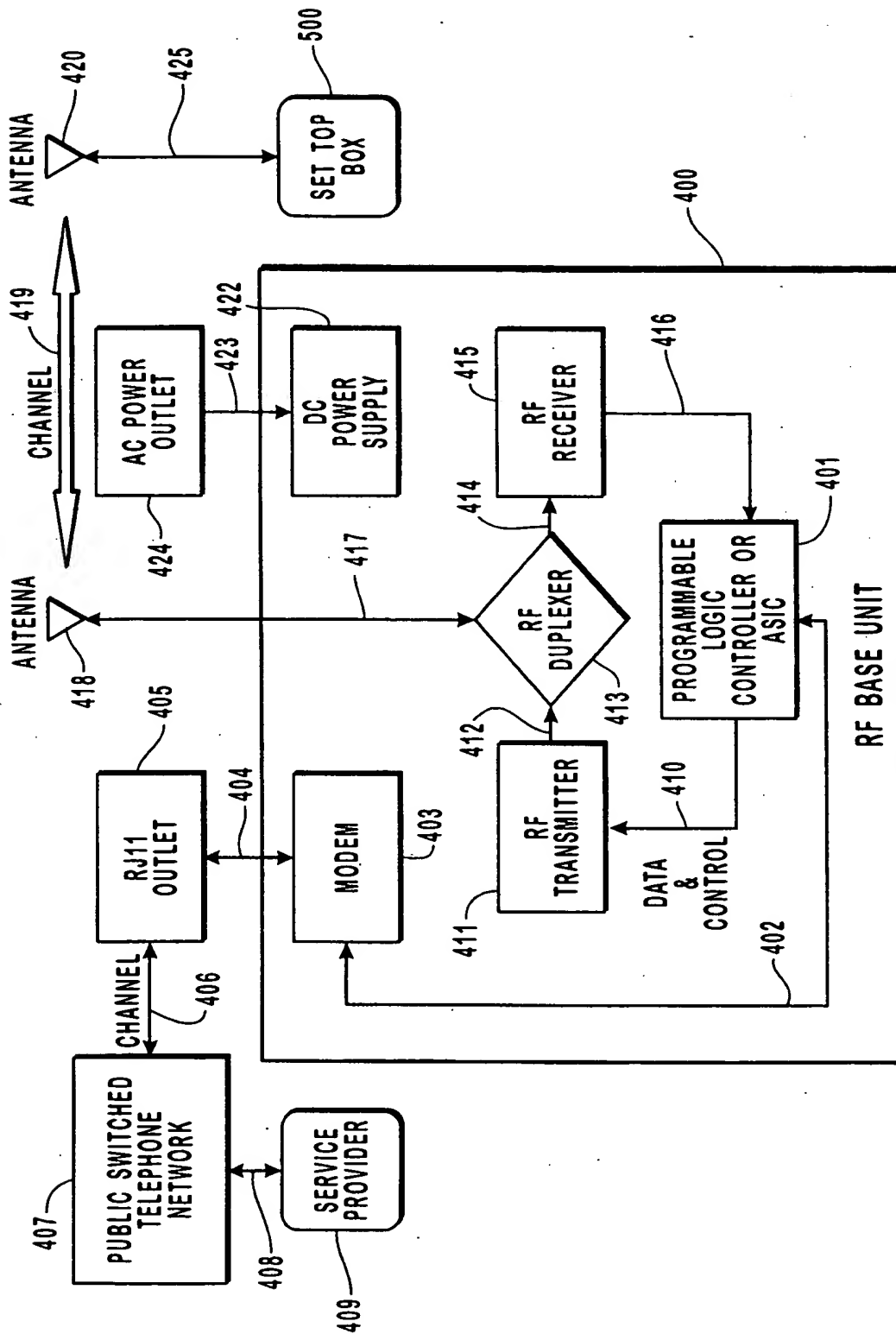


FIG. 4

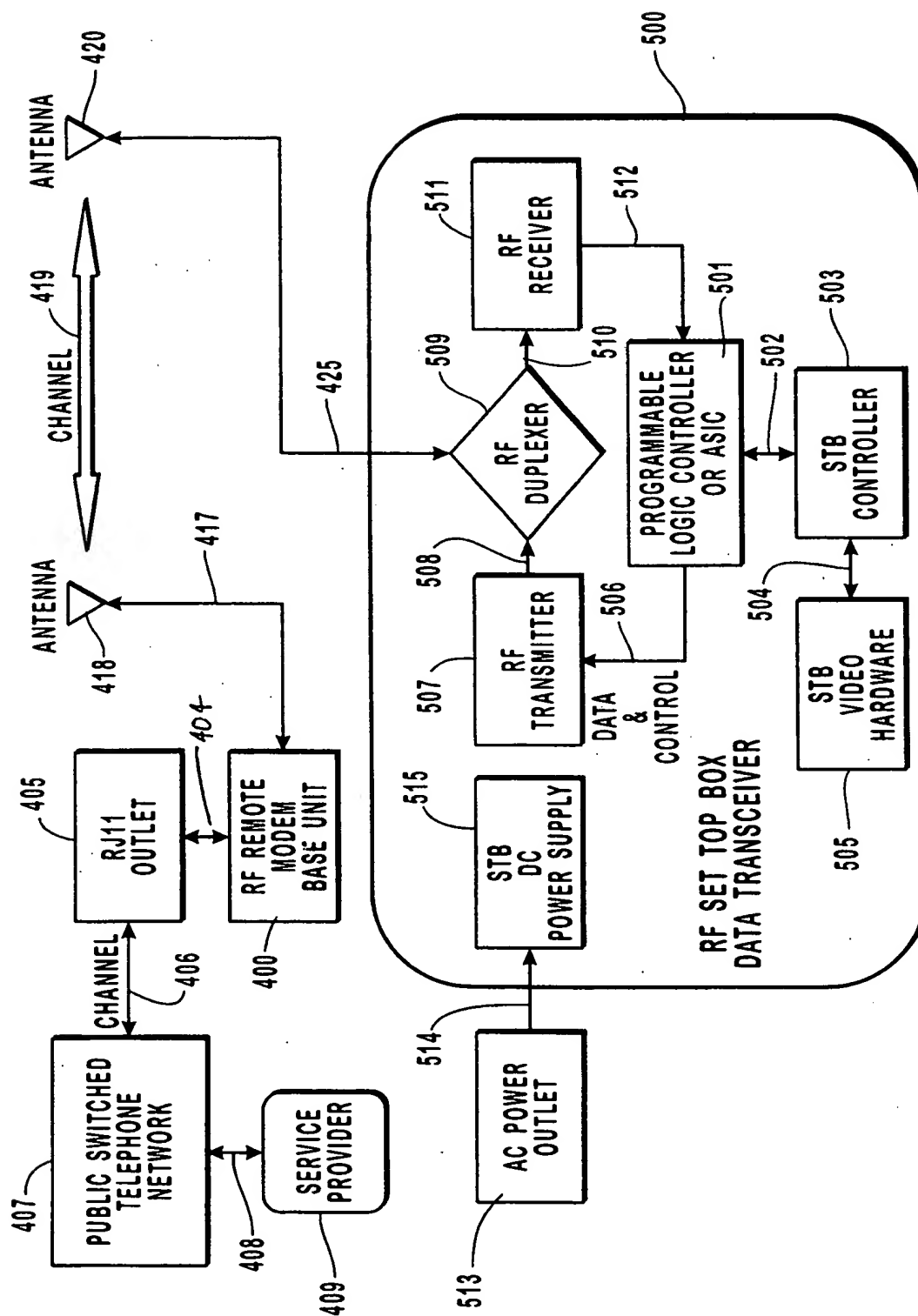


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/34642

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :H04N 7/16, 173

US CL :725/106, 122, 123, 131, 139, 151

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 725/106, 122, 123, 131, 139, 151

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
None

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EAST

Search terms: set top box, set top terminal, STB, decoder, wireless, wireless modem

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,708,961 A (HYLTON et al.) 13 January 1998, col. 4, line 54 to col. 11, line 23.	1-15
Y	US 5,831,664 A (WHARTON et al.) 03 November 1998, col. 1, line 60 to col. 2, line 53.	1-15.
X, P —	US 6,064,437 A (PHAN et al.) 16 May 2000, col. 1, line 50 to col. 2, line 54.	1-6. -----
Y, P	See col. 4, line 17 to col. 5, line 21.	7-15.
Y, P	US 6,084,638 A (HARE et al.) 04 July 2000, col. 3, line 35 to col. 5, line 35.	1-15.
X, P	US 6,141,356 A (GORMAN) 31 October 2000, see col. 5, line 60 to col. 9, line 7.	1-15.



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
A document defining the general state of the art which is not considered to be of particular relevance	*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
B earlier document published on or after the international filing date	*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*Z* document member of the same patent family
O document referring to an oral disclosure, use, exhibition or other means	
P document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

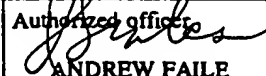
09 FEBRUARY 2001

Date of mailing of the international search report

18 APR 2001

Name and mailing address of the ISA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer

ANDREW FAILE

Telephone No. (703) 305-4380

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ **BLACK BORDERS**
- ☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- ☐ **FADED TEXT OR DRAWING**
- ☐ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- ☐ **SKEWED/SLANTED IMAGES**
- ☐ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- ☐ **GRAY SCALE DOCUMENTS**
- ☐ **LINES OR MARKS ON ORIGINAL DOCUMENT**
- ☐ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- ☐ **OTHER:** _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.